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NATIONAL INSTITUTES OF HEALTH
STATE-OF-THE-SCIENCE CONFERENCE STATEMENT
Cesarean Delivery on Maternal Request
March 27–29, 2006

NIH consensus and state-of-the-science statements are prepared by independent panels of health professionals and public representatives on the basis of (1) the results of a systematic literature review prepared under contract with the Agency for Healthcare Research and Quality (AHRQ), (2) presentations by investigators working in areas relevant to the conference questions during a 2-day public session, (3) questions and statements from conference attendees during open discussion periods that are part of the public session, and (4) closed deliberations by the panel during the remainder of the second day and morning of the third. This statement is an independent report of the panel and is not a policy statement of the NIH or the Federal Government.

The statement reflects the panel's assessment of medical knowledge available at the time the statement was written. Thus, it provides a "snapshot in time" of the state of knowledge on the conference topic. When reading the statement, keep in mind that new knowledge is inevitably accumulating through medical research.

Introduction

Since the late 1970s, the U.S. cesarean delivery (CD) rate has received considerable attention. Primary and repeat CD rates for all women have now reached their highest levels. Cesarean delivery on maternal request (CDMR) is defined as a CD for a singleton pregnancy on maternal request at term in the absence of any medical or obstetrical indications. CDMR is a subset of elective CD. Elective CD includes a planned CD for a wide range of maternal and fetal indications and is generally distinguished from emergency CD and "labored" CD after planned vaginal delivery (PVD). In 2004, 1.2 million or 29.1 percent of live births in the United States were by CD. Internationally and domestically, estimates of CDMR range from 4 to 18 percent of all CD; however, there is little confidence in the validity of this estimate. Limited evidence suggests that CDMR is increasing, but it is unclear why. Any decision to deliver by CDMR should be guided by the best possible information regarding potential health outcomes for both mother and baby. Toward that end, the National Institute of Child Health and Human Development (NICHD) and the Office of Medical Applications of Research (OMAR) of the National Institutes of Health (NIH) convened a State-of-the-Science Conference from March 27 to 29, 2006, to assess the available scientific evidence relevant to the following questions:

- What is the trend and incidence of cesarean delivery over time in the United States and other countries (when possible, separate by intent)?
- What are the short-term (under 1 year) and long-term benefits and harms to mother and baby associated with cesarean delivery by request versus attempted vaginal delivery?

- What factors influence benefits and harms?

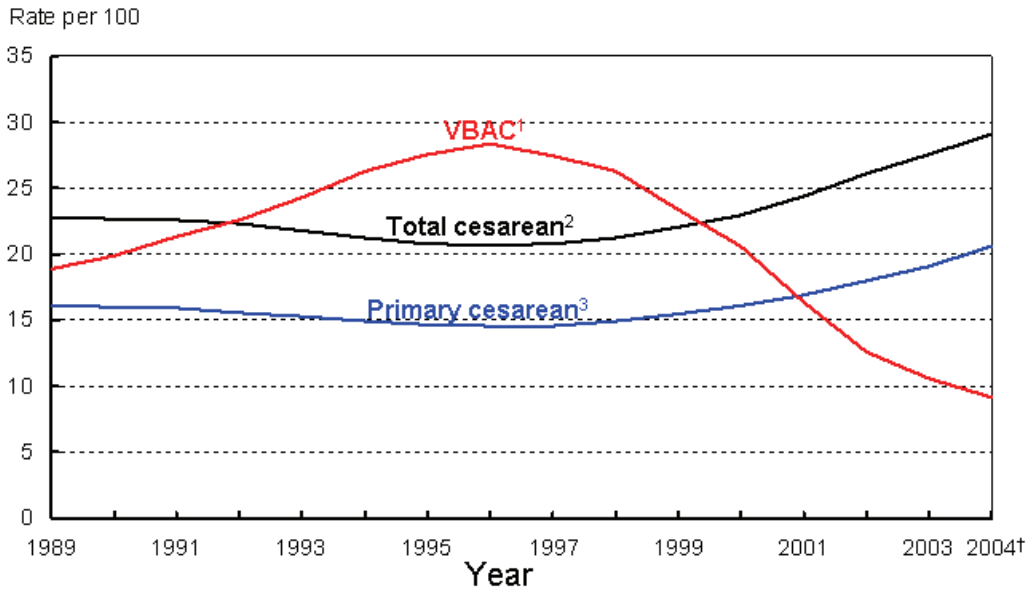
- What future research directions need to be considered to get evidence for making appropriate decisions regarding cesarean delivery on request or attempted vaginal delivery?

An impartial, independent panel was charged with reviewing the available published literature in advance of the conference, including a systematic literature review commissioned through the Agency for Healthcare Research and Quality (AHRQ). The first day and a half of the conference consisted of presentations by expert researchers and practitioners as well as open public discussions. The panel held a press conference to address questions from the media. The draft statement will be published online later today, and approximately 6 weeks following the conference, the final version will be released.

1. What is the trend and incidence of cesarean delivery over time in the United States and other countries (when possible, separate by intent)?

After rapid increases in the 1970s and early 1980s, total CD rates in the United States declined in the late 1980s through to 1996, after which they again increased. In 2004, the rate of CD was 29.1 percent, the highest ever reported. One of the major drivers of the overall increase in CD has been that, after a first CD, the likelihood of CD increases in subsequent pregnancies. Importantly, the increase in primary CD parallels the total CD rate, which cannot, therefore, be explained by the decreasing use of vaginal birth after cesarean (VBAC) (Figure 1).

Figure 1. Total and primary cesarean rate and vaginal birth after previous cesarean (VBAC): United States, 1989–2004, Centers for Disease Control



†Preliminary data
[1]Number of vaginal births after previous cesarean per 100 live births to women with a previous cesarean delivery.
[2]Percentage of all live births by cesarean delivery.
[3]Number of primary cesarean deliveries per 100 live births to women who have not had a previous cesarean.
NOTE: Due to changes in data collection from implementation of the 2003 revision of the U.S. Standard Certificates of Live Birth, there may be small discontinuities in rates of primary cesarean delivery and VBAC in 2003 and 2004.

The increase in primary CD occurs in all ethnic and age groups. In the absence of any increase in known clinical risk factors for primary CD, it is plausible that some of the primary CD increase is because of CDMR; however, CDMR is not readily identifiable in any existing studies or U.S. national databases, either currently or historically. It has been estimated, in the United States and internationally, that some 4–18 percent of all CD is CDMR, but there is little confidence in the validity of these estimates. One published study of primary CD with "no indicated risk," using national U.S. birth certificate data from 1991 to 2001, showed overall increases from 3.3 percent to 5.5 percent of all live births, with higher rates in older primiparous women (increases in primiparous women age 40 and older from 18.2% to 25.7%). However, birth certificates do not indicate "maternal request," so these reports cannot be used to confidently infer CDMR. It is also suggested, using statistical algorithms to identify women requesting CD, that CD without labor or some medical indications has increased from 1.9 percent of all deliveries in 2001 to 2.6 percent in 2003, but this too requires confirmation.

Other countries report CD rates increasing over recent time but generally at lower levels than found in the United States. For example, in Canada, the overall CD rate increased from 18.0 percent in 1994–1995 to 22.1 percent in 2000–2001. Similarly, most countries do not collect information specifically about patient choice, and information that is reported comes from special surveys. One hospital in Italy reported that maternal request rose from 4.5 percent of all CD in 1996 to 9 percent in 2000. A Swedish hospital reported increases from 8.9 percent in 1994 to 15.8 percent in 1999, and in Norway, in 1998–1999, a national survey found 7.6 percent of all CDs performed were by maternal request. Taiwan has a national database that codes for CDs performed at maternal request. The rate of deliveries so coded increased from 2 percent (of all women without a clinical indication for CD) in 1997 to 3.5 percent in 2001, with higher increases in women 35 and older (respectively, 3.6% increased to 6.6%). Because in Taiwan CDMR is only reimbursed at the cost of vaginal deliveries, these rates may be spuriously low.

Some authors have proposed an "ideal rate" of all CDs (such as 15%) for a population. There is no consistency in this ideal rate, and artificial declarations of an ideal rate should be discouraged. Goals for achieving an optimal CD rate should be based on maximizing the best possible maternal and neonatal outcomes, taking into account available medical and health resources and maternal preferences. Thus, optimal CD rates will vary over time and across different populations according to individual and societal circumstances.

Indications for CD represent a continuum ranging from clear medical need, such as placenta previa, to women with no risk factors who declare a preference for CD well before labor. Many women have multiple indications for CD in the same pregnancy. This makes it problematic in many cases to determine whether or not a specific CD is due to maternal request. Hence, the collection of precise statistics on prevalence of CD by indication is very difficult.

2. What are the short-term (under 1 year) and long-term benefits and harms to mother and baby associated with cesarean delivery by request versus attempted vaginal delivery?

Framework of the Evidence Analysis

The plan for the evidence review was to assess the state of the science regarding outcome differences in women who elect planned CD versus PVD. The planned CD group is assumed to consist of women who elect CD by 39–40 weeks including those who had experienced onset of spontaneous labor prior to their scheduled CD dates. The PVD group is heterogeneous because it consists of women electing vaginal delivery who will have spontaneous or assisted vaginal delivery or indicated CD after labor or spontaneous rupture of membranes up to 42 weeks. Good quality evidence directly assessing differences in outcomes between planned CD and PVD is sparse; thus, the analysis frequently relies on proxy definitions such as "scheduled cesarean" for "planned cesarean" and "vaginal births plus emergency cesareans" for "planned vaginal." A number of potential outcomes were not assessed due to a lack of data availability or clarity. Among these were hospital readmissions, adhesions, and chronic abdominal and pelvic pain syndrome.

The panel considered data summarized in the Evidence-based Practice Center (EPC) Report, additional evidence identified separately from cohort and case control studies, and input from the invited speakers and audience participants at the NIH State-of-the-Science Conference.

Quality and Relevance of the Evidence

For the evidence obtained from the EPC report, the panel utilized an evidence quality grading scale provided within the document: Level I—strong, Level II—moderate, Level III—weak, and Level IV—absent. No Level I evidence was found, three outcomes had Level II evidence, and the remaining outcomes were Level III or IV. Interpretation of many outcome variables was confounded by a lack of appropriate comparison groups, a lack of consistency in outcome definitions, and the frequent use of composite outcomes.

Maternal Outcomes With Moderate-Quality Evidence

Two outcome variables had moderate-quality evidence, both short-term maternal variables.

Hemorrhage. The frequency of postpartum hemorrhage associated with planned CD is less than that reported with the combination of PVD and unplanned CD.

Maternal length of hospital stay is higher for CD, planned or otherwise, than for vaginal delivery. However, these analyses are affected by comparing planned and unplanned CDs to all vaginal deliveries. Numerous factors may also influence length of hospital stay, including obstetrical complications, insurance coverage, regional practice patterns, provider and patient preference, and neonatal hospital stay.

Maternal Outcomes With Weak-Quality Evidence Which Favor PVD

Infection is lower for all vaginal than for all CDs. Planned CDs have lower infection rates than unplanned CDs but higher than vaginal deliveries.

Anesthetic complications. Conflicting studies generally show a lower rate of such complications with PVD than with planned CD. However, the surveyed literature has a higher prevalence of general anesthesia and a lower utilization of regional anesthesia for unscheduled CDs than in contemporary practice, which may mitigate the possible advantage for PVD. A potential advantage of planned CD is the avoidance of emergency induction of anesthesia. While in-hospital post-cesarean analgesia practices have improved markedly, less attention has been focused on quantitation and management of perineal pain. Reliable information is lacking regarding short-term post-discharge pain.

Subsequent placenta previa. The risk of this complication increases with the number of prior CD, advancing maternal age, and parity. A meta-analysis indicates a doubling of risk in women who have had CD compared to women who have had vaginal deliveries.

Breastfeeding. Early and sustained breastfeeding is an important practice promoting infant and child health. A meta-analysis found that women who had CD (planned and unplanned combined) were more likely to bottle feed than women who had vaginal deliveries. However, social practices and medical factors (early bonding or infant isolation from mother who had CD, medical complications, neonatal intensive care unit [NICU] admissions and specifics of surgical recovery) may delay the initiation of breastfeeding. Limited data from randomized controlled trials indicate no difference in the duration of breastfeeding when planned CD and vaginal deliveries were compared within the first year.

Maternal Outcomes With Weak-Quality Evidence Which Favor CDMR

Urinary incontinence. Studies indicate that the rate of stress urinary incontinence (SUI) after "elective" CD is lower than for vaginal delivery, but the duration of this effect is not clear, particularly in older populations and in women who had multiple deliveries. There is evidence that the risk of SUI may be increased when forceps are used to assist vaginal delivery. Urinary incontinence is multifactorial, and reduction in SUI associated with CDMR may be partially offset by other processes including advancing age and increases in body-mass index (BMI).

Surgical and traumatic complications. The evidence consistently indicates a lower risk of surgical complications in "elective" cesarean than in unplanned CD resulting from attempted vaginal delivery. Among PVD which include assisted deliveries and in-labor cesareans, there is a significantly higher rate of obstetrical trauma than among planned CD. The net direction of the evidence thus favors planned CD. However, the frequency of obstetric trauma, such as third and fourth degree perineal lacerations, can be reduced by labor management practices such as reducing the use of midline episiotomy and limiting the use of forceps delivery whenever possible.

Maternal Outcomes With Weak-Quality Evidence Which Are Sensitive to Parity and Planned Family Size

Subsequent uterine rupture is a concern in subsequent pregnancies. Meta-analyses provide consistent evidence that the incidence of uterine rupture during VBAC is significantly higher than with elective repeat CD.

Hysterectomy. Existing evidence from weak-quality studies has shown no difference in the risk of peripartal hysterectomy among those with first PVD or planned CD, although these studies generally lacked adequate power to examine these outcomes. However, as there is convincing evidence of increased risk of hemorrhage and hysterectomy in patients with multiple cesareans, decisions regarding route of delivery should be influenced by the number of pregnancies expected or planned. The risk of hysterectomy for placenta previa and placenta accreta rises sharply with increasing numbers of CD. For the women with one prior CD, a decision-analysis indicated that planned CD will likely result in fewer hysterectomies because of the decreased incidence of uterine rupture. However, in women with multiple CDs, the likelihood of hysterectomy is elevated because of the increased frequency of placenta accreta.

Subsequent fertility. Cohort studies have demonstrated a reduction in subsequent pregnancies in women with CD compared to those who delivered vaginally. This effect may be due to voluntary limitation of family size.

Maternal Outcomes With Weak-Quality Evidence Which Favor Neither Delivery Route

Inconsistent assessments and variable definitions prevented judgment regarding risks by delivery route for the following outcomes: anorectal function, postpartum pain, postpartum depression, sexual function, pelvic pain, and fistula. For thromboembolism, there was conflicting evidence. The following outcomes warrant further discussion.

Anorectal function. Several case-control studies supply weak-quality evidence for reduced risk of anal incontinence in planned CD compared with unplanned CDs or instrumental vaginal deliveries. The data demonstrate an association between anal sphincter disruption and fecal incontinence. Use of midline episiotomy and use of forceps are associated with sphincter disruption. Limiting these practices can reduce the frequency of this injury.

Sexual function. Any differences in sexual function based on route of delivery were no longer evident by 6 months postpartum. Factors that affect sexual functioning, such as changing family roles, relationship satisfaction, physical recovery or continuing morbidities, mood, and lack of sleep, have not been adequately studied.

Pelvic organ prolapse. Data suggest an association of some vaginal deliveries with levator muscle, connective tissue, and pelvic nerve injury; however, the precise relationship with pelvic organ prolapse, as well as possible modifiers of labor management to avoid such injuries, remains to be delineated.

Subsequent stillbirth. There were inadequate data to judge a difference between delivery routes for this outcome. Although a recent retrospective cohort study suggested higher stillbirth risk in subsequent pregnancies in women who had a previous CD, the lack of documentation of the indication for the prior CD limits interpretation of this outcome.

Maternal mortality. Existing studies were inadequately powered to evaluate this rare outcome.

Neonatal Outcome With Moderate-Quality Evidence Which Favors PVD

Respiratory morbidity. Evidence indicates that respiratory morbidity, which is sensitive to gestational age, is higher for all CDs than for vaginal deliveries. Studies consistently report increasing respiratory morbidity with elective CD compared to PVD with gestational ages earlier than 39–40 weeks. Most of the respiratory problems that accompany CD result from delays in neonatal transition, such as transient tachypnea of the newborn (TTN) and mild respiratory distress syndrome (RDS). Infrequently, infants can develop severe respiratory failure and pulmonary hypertension.

Neonatal Outcomes With Weak-Quality Evidence Which Favor PVD

Iatrogenic prematurity. No studies directly addressed unexpected prematurity and allowed comparisons by type of CD with intended or actual vaginal delivery. However, there is an approximate doubling of the rates of respiratory symptoms and other problems of neonatal adaptation (e.g., hypothermia, hypoglycemia) and NICU admissions for infants delivered by CD for each week below 39–40 weeks. Therefore, CDMR may be associated with a number of neonatal morbidities. These effects can be minimized if gestational age is accurately known, lung maturity is documented, and elective CD is not performed before 39 weeks of gestational age.

Neonatal length of hospital stay. Evidence indicates that neonatal length of hospital stay is longer for "elective" CD than for vaginal delivery. Length of stay is increased when delivery is complicated.

Neonatal Outcomes With Weak-Quality Evidence Which Favor CDMR

Fetal mortality. Based on epidemiologic modeling, there is an increased risk of stillbirth in the PVD group, because planned CD would result in delivery by 40 weeks, and PVD could occur up to 42 weeks.

Intracranial hemorrhage, neonatal asphyxia, and encephalopathy. Consistently higher rates of intracranial hemorrhage are observed in operative vaginal delivery and CD in labor, suggesting CDMR should be associated with lower risk of intracranial hemorrhage than the aggregate of spontaneous and assisted vaginal deliveries that comprise PVD. Evidence indicates a lower risk of neonatal asphyxia and encephalopathy with "elective" CD compared to operative and spontaneous vaginal deliveries plus "emergency" or "labored" cesareans, which comprise "planned vaginal delivery."

Birth injury and laceration. The incidence of brachial plexus injury is significantly lower in CD than in spontaneous vaginal delivery and significantly lower than in assisted vaginal delivery. There is a higher rate of fetal lacerations among emergency and labored cesareans than among elective CD, suggesting that CDMR poses no additional risk for fetal lacerations beyond those associated with PVD.

Neonatal infection. Infants born by vaginal delivery will tend to have more evaluations for and increased incidence of infection than babies delivered by planned CD.

Neonatal Outcome Which Favors Neither Planned Delivery Route

Studies of neonatal mortality lacked statistical power. Poor data quality limited interpretation of studies on long-term neonatal outcomes.

Summary

With the exception of three outcome variables with moderate-quality evidence (maternal hemorrhage, maternal length of stay, and neonatal respiratory morbidity), all of the remaining outcome assessments considered by the panel were based on weak evidence. This significantly limits the reliability of judgments regarding whether an outcome measure favors either CDMR or PVD.

3. <u>What factors influence benefits and harms</u>?

For most women, vaginal birth is the norm. Indications for CD vary widely and present as a spectrum. Fear of labor and its potential complications as well as desire for control stand at one end of the spectrum and may be influenced by a woman's personal experiences. At the other end of the spectrum are absolute medical indications, such as placenta previa. It may be difficult to identify the precise point along this continuum at which the request for CD is not medically indicated. While the potential benefits and harms favor neither PVD nor CDMR, there are patient-specific, cultural, and societal factors; provider issues; professional resources; and ethical issues that could influence the benefits and harms of CDMR.

Patient-Specific Factors

Age is an important and independent risk factor for CD. As women age, subfertility is more common, as is the use of reproductive technologies to achieve pregnancy. Complications in labor may be associated with increasing maternal age and with the use of reproductive technologies. As increasing numbers of women choose to delay having their first child, the relative benefits of CDMR may outweigh the risks.

Childbearing plans influence harms and benefits of CDMR. Morbidity and serious complications increase substantially in women with increasing numbers of pregnancies. Therefore, PVD provides an improved benefit/risk ratio for women who desire several children.

Obesity is a known risk factor for CD and for postoperative surgical morbidity such as infectious complications and venous thromboembolism. Obesity is also a risk factor for urinary incontinence and pelvic floor disorders. Additionally, obesity significantly increases the risks

associated with an emergent CD during labor. Current evidence does not provide a clear estimate of the risks and benefits of CDMR in obese women.

Accuracy of estimated gestational age and the calculated estimated date of confinement (due date) can substantially affect the risk/benefit ratio of CDMR because neonatal respiratory morbidity decreases with increasing gestational age. Uncertainty regarding gestational dating is not uncommon and can lead to estimated dates that are inaccurate by 2 or 3 weeks. Elective CD at presumed 39 weeks has the potential to result in neonatal respiratory morbidity. Therefore, adherence to established guidelines to increase the accuracy of gestational age is imperative when making the decision to provide CDMR.

Psychological factors may influence maternal decisions regarding mode of delivery. Personality factors, such as a need to be in control of the birth process, may be paramount for some women. Life-altering experiences, such as interpersonal violence, traumatic delivery, or infant death, can lead to symptoms of posttraumatic stress disorder, depression, or feelings of guilt that influence a woman's decision. Such experiences or illnesses can cause ambivalence regarding the pregnancy, or even an overwhelming fear of labor and delivery. While satisfaction with birth and quality of postpartum life are important outcomes of the delivery process, few data are available to facilitate an understanding of these factors. Anxiety about delivery and feelings of inadequacy regarding labor can complicate the decisionmaking process. Given the potential of such potent psychological factors, the line between what constitutes an acceptable "medical indication" and what is not medically indicated becomes less clear.

Cultural and Societal Issues

Cultural beliefs and practices influence perceptions and desires regarding labor and delivery. Some cultures have developed rituals and customs associated with vaginal birth. Active participation in the process of labor and birth are important experiences with significant psychological benefits. Other women may attribute less importance to the specifics of delivery and value the control of the process afforded by CD as a benefit. In any discussion of the relative benefits and risks of CDMR versus PVD, the cultural and personal importance of labor and delivery should be valued.

A consequence of the increasing rates of CD is that this mode of delivery may be perceived as the norm. The perception that the risks of CD are similar or lower than attempted VBAC and the shift away from vaginal breech deliveries may further contribute to societal acceptance of cesarean births. Media coverage may further increase concerns about the potential morbidity of PVD. Such a shift in acceptance by patients and providers may lead to an increase in CDMR.

Provider Type and Professional Resources

Obstetrical providers in the United States include midwives, family practice physicians, obstetricians, and maternal–fetal medicine specialists. Factors that influence provider attitude contribute to the complexity of the issues surrounding CDMR. A provider's view of CDMR may be influenced by his or her training, practice environment and experience, personal philosophy regarding birth, and medicolegal experiences.

The vast majority of births in the United States are managed in a hospital setting. The geographical location and the level of perinatal services in the hospital may be a consideration, especially in the management of a birth that may result in CD. A woman may make a decision regarding delivery site dependent upon the level of care or technology she perceives necessary or desirable. Such consideration may include the availability of anesthesiologists or operating room staff for CD, and may extend to the issue of time of day that such services are available. The availability of resources may also influence a provider's recommendation regarding CD. Hospital resources such as operating rooms and staff may be factors that influence the decision to schedule a CD. The unpredictability of the timing and length of labor for a provider's lifestyle and fatigue level presents challenges to patient safety. Economic considerations, such as insurance coverage, payment, and scheduling conflicts, may also impact a provider's decision to recommend an elective CD. Because of the complexity of these situations and the potential for biased recommendations, women should be fully informed about these issues and actively participate in the decisionmaking process.

Ethical Issues

The foundation of the ethical relationship between a woman and her healthcare providers is based on a respectful partnership that requires the exchange of accurate information and effective communication. In the context of childbirth, this process includes discussions of the relative risks and benefits of PVD, including a realistic assessment of the potential complications and outcomes. If a woman requests information on CD in the absence of medical indication, her provider should engage in nondirective counseling that incorporates the woman's values and cultural context with sensitivity to the patient's concerns. For example, if the woman has a fear of the pain during labor, pain management strategies should be addressed. If her concern is about future pelvic floor disorders, her provider should discuss labor and delivery management to minimize these risks as well as a summary of the relevant scientific data. In every case, discussions should maximize her understanding of the issues and should be specific to her personal needs, such as future reproductive plans, medical risk factors, psychological needs, social and family situation, and other factors. Risks and benefits of CDMR versus PVD must be individualized and based on a shared decisionmaking process. After thorough discussion and review, CDMR may be a reasonable alternative to PVD. When a provider cannot support this request, it is appropriate to refer the woman to another provider.

Birth is inherently a natural process. The majority of women would like to achieve a spontaneous vaginal delivery and should be supported in their efforts to achieve that goal. The available evidence and data comparing risks and benefits of PVD and CDMR are sparse and provide few clear conclusions. There is no direct evidence comparing CDMR to PVD. Since most studies attempting to make a valid comparison fail to adjust for important confounders, inferences about factors that can influence the harms and benefits must be interpreted cautiously. Based on indirect evidence, there appear to be relatively similar degrees of risk from both pathways in women intending to limit their childbearing to one or two children. Although the ratio of risks and benefits may be similar on a population level, it will vary from woman to woman. Providers should consider societal and cultural norms, the environment, and physical resources, as well as individual patient factors. Each woman deserves individualized counseling consistent with ethical principles and based on the available scientific data when discussing the risk/benefit ratio and the option of CDMR.

4. **<u>What future research directions need to be considered to get evidence for making appropriate decisions regarding cesarean delivery on request or attempted vaginal delivery</u>?**

- Surveys of women (before and after birth), providers, insurers, and healthcare facilities regarding CDMR will provide a basis for assessing the current extent of CDMR and attitudes about it.

- Create mechanisms to identify CDMR, such as establishing Current Procedural Terminology (CPT) coding and improving the birth certificate. This will facilitate tracking and further research on short- and long-term risks and benefits for mothers and children.

- There should be increased research devoted to strategies to predict and influence the likelihood of successful vaginal birth, particularly in the first pregnancy.

- Because of the limitations inherent in administrative databases and retrospective studies, large prospective cohorts enrolling participants beginning early in the first pregnancy will provide important information. Ideally, such studies would extend to long-term followup of mothers and children.

- For rare but critical outcomes, very large databases will be the only immediately available realistic source of reliable prospective data. Such databases can be explored to assess incidence rates of a variety of outcomes. Well-designed case–control studies also may be helpful.

- The feasibility of randomized trials should be explored. It may be difficult to enroll an adequate number of women willing to be randomized to a planned CD versus PVD.

- Future studies should determine whether there are modifiable factors in the management of labor that can decrease maternal and neonatal complications. Furthermore, an attempt should be made to identify subgroups of women at higher risk for complications that would benefit most from planned CDMR.

- Studies comparing CDMR and PVD should consider the following key outcomes:

  — Maternal

    ♦ Maternal death

    ♦ Placental abnormalities including previa and accreta

    ♦ Pelvic floor disorders (effects of pregnancy, labor, and delivery on continence and support mechanisms while controlling for effects of aging on pelvic floor; identification of modifiable factors in the management of labor that would decrease risk of future pelvic floor disorders without having to perform CD;

identifying a population at high risk for development of pelvic floor disorders who would benefit most from CDMR)

- ♦ Psychological factors, including quality of life issues and satisfaction with birth experience

— Neonatal—neonatal death, neonatal encephalopathy, cerebral palsy, brachial plexus injury, respiratory and neurodevelopmental outcomes, and other birth injuries

- A thorough assessment of the costs of CDMR is warranted. These cannot be simply extrapolated from current costs associated with CD overall, which includes expensive emergent procedures. Planned CDMR will have different cost implications that should be modeled explicitly.

Conclusions

1. The incidence of CD without medical/obstetrical indications is rising in the United States, and a component of this is due to CDMR. Given the tools available, the magnitude of the CDMR component is difficult to quantify.

2. There is insufficient evidence to evaluate fully the benefits and risks of CDMR as compared to PVD, and more research is needed.

3. Until quality evidence becomes available, any decision to perform a CDMR should be carefully individualized and consistent with ethical principles.

4. Given that the risks of placenta previa and accreta rise with each CD, CDMR is not recommended for women desiring several children.

5. CDMR should not be performed prior to 39 weeks or without verification of lung maturity, because of the significant danger of neonatal respiratory complications.

6. Request for CDMR should not be motivated by unavailability of effective pain management. Efforts must be made to assure availability of pain management services for all women.

7. NIH or another appropriate Federal agency should establish and maintain a Web site to provide up-to-date information on the benefits and risks of all modes of delivery.

State-of-the-Science Panel

Mary E. D'Alton, M.D.
Panel and Conference Chairperson
Willard C. Rappleye Professor of Obstetrics and Gynecology
Chair, Department of Obstetrics and Gynecology
Director, Obstetrics and Gynecology Services, Columbia University Medical Center
College of Physicians and Surgeons
Columbia University
New York, New York

Michael P. Aronson, M.D.
Professor of Obstetrics and Gynecology
University of Massachusetts Medical School
Director of Women's Health Services
University of Massachusetts Memorial Medical Center
Worcester, Massachusetts

David J. Birnbach, M.D.
Professor and Executive Vice Chairman, Department of Anesthesiology
Chief, Women's Anesthesia, Jackson Memorial Hospital
Director, University of Miami Jackson Memorial Hospital Center for Patient Safety
Miller School of Medicine
University of Miami
Miami, Florida

Michael B. Bracken, Ph.D., M.P.H., FACE
Susan Dwight Bliss Professor of Epidemiology
Professor of Obstetrics, Gynecology, Reproductive Science, and Neurology
Center for Perinatal, Pediatric and Environmental Epidemiology
Yale University
New Haven, Connecticut

M. Yusoff Dawood, M.D.
Professor of Obstetrics and Gynecology
Professor of Physiology
Sanger Chair in Family Planning and Reproductive Physiology
West Virginia University School of Medicine
Health Sciences Center
Morgantown, West Virginia

William G. Henderson, Ph.D., M.P.H.
Professor and Biostatistics Core Director
University of Colorado Health Outcomes Program
Professor, Department of Preventive Medicine and Biometrics
University of Colorado
Aurora, Colorado

Barbara Hughes, C.N.M., M.S., M.B.A., FACNM
Director of Nurse-Midwifery
Exempla Saint Joseph Hospital
Clinical Faculty
University of Colorado Health Sciences Center
Denver, Colorado

Alan H. Jobe, M.D., Ph.D.
Professor of Pediatrics
University of Cincinnati
Division of Pulmonary Biology
Cincinnati Children's Hospital Medical Center
Cincinnati, Ohio

Vern L. Katz, M.D.
Clinical Professor of Obstetrics and Gynecology
Oregon Health Science University
Adjunct Professor
Department Physiology
University of Oregon
Medical Director of Perinatal Services
Department of Obstetrics and Gynecology
Sacred Heart Medical Center
Eugene, Oregon

Stephen R. Kraus, M.D., FACS
Assistant Professor and Deputy Chairman
Department of Urology
University of Texas Health Science Center at San Antonio
San Antonio, Texas

Meg Mangin, R.N.
Dunn County Home Health Care
Menomonie, Wisconsin

JoAnn Elizabeth Matory, M.D.
Clinical Associate Professor of Pediatrics
Department of Pediatrics
Indiana School of Medicine
James Whitcomb Riley Hospital for Children
Indianapolis, Indiana

Thomas R. Moore, M.D.
Professor and Chairman, Department of Reproductive Medicine
School of Medicine
University of California, San Diego Medical Center
San Diego, California

Patricia J. O'Campo, Ph.D.
Professor, Public Health Sciences
University of Toronto
Alma and Baxter Ricard Chair in Inner City Health
Director, Inner City Health Research Unit
St. Michael's Hospital
Toronto, Canada

Jeffrey F. Peipert, M.D., M.P.H., M.H.A.
Vice Chair of Clinical Research
Professor
Department of Obstetrics and Gynecology
Washington University in St. Louis School of Medicine
St. Louis, Missouri

Karen H. Rothenberg, J.D., M.P.A.
Dean and Marjorie Cook Professor of Law
University of Maryland School of Law
Baltimore, Maryland

Meir Jonathan Stampfer, M.D., Dr.P.H.
Professor of Medicine
Professor of Epidemiology and Nutrition
Chair, Department of Epidemiology
Harvard School of Public Health
Boston, Massachusetts

Kimberly A. Yonkers, M.D.
Associate Professor
Department of Psychiatry
Department of Epidemiology and Public Health
Yale School of Medicine
New Haven, Connecticut

Speakers

Susan Dentzer
Health Correspondent and Head of the Health Policy Unit
The NewsHour with Jim Lehrer on PBS
Arlington, Virginia

Maurice L. Druzin, M.D.
Professor and Chief
Division of Maternal-Fetal Medicine
Obstetrics and Gynecology
Stanford University
Stanford, California

Dee Fenner, M.D.
Director of Gynecology
Department of Obstetrics and Gynecology
University of Michigan
Ann Arbor, Michigan

Melissa L. Gilliam, M.D., M.P.H.
Associate Professor of Obstetrics, Gynecology, and Epidemiology
The University of Chicago
Chicago, Illinois

Victoria L. Handa, M.D.
Associate Professor
Department of Obstetrics and Gynecology
Johns Hopkins University
Baltimore, Maryland

Gary D.V. Hankins, M.D.
Professor and Vice Chairman
Department of Obstetrics and Gynecology
University of Texas Medical Branch at Galveston
Galveston, Texas

Lucky Jain, M.D., M.B.A.
Professor and Executive Vice Chair
Department of Pediatrics
Emory University
Atlanta, Georgia

Mark A. Klebanoff, M.D., M.P.H.
Director
Division of Epidemiology, Statistics, and Prevention Research
National Institute of Child Health and Human Development
National Institutes of Health
Bethesda, Maryland

Fay Menacker, Dr.P.H., C.P.N.P.
Statistician
Division of Vital Statistics
National Center for Health Statistics
Centers for Disease Control and Prevention
Hyattsville, Maryland

Howard Minkoff, M.D.
Chairman
Department of Obstetrics and Gynecology
Maimonides Medical Center
Brooklyn, New York

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Head
Department of Obstetrics and Gynecology
Christie Clinic at Champaign
Champaign, Illinois

Ingrid Nygaard, M.D., M.S.
Professor
Department of Obstetrics and Gynecology
University of Utah College of Medicine
Salt Lake City, Utah

Holly E. Richter, Ph.D., M.D.
Medical Surgical Gynecology
University of Alabama at Birmingham
Birmingham, Alabama

Benjamin P. Sachs, M.D.
Professor and Chair
Obstetrics and Gynecology
Beth Israel Deaconess Medical Center
Harvard Medical School
Professor
Department of Obstetrics and Gynecology
Harvard School of Public Health
Boston, Massachusetts

Anthony G. Visco, M.D.
Associate Professor
Division of Urogynecology and Reconstructive Pelvic Surgery
Department of Obstetrics and Gynecology
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Meera Viswanathan, Ph.D.
Research Health Analyst
RTI International
Research Triangle Park, North Carolina

Joseph R. Wax, M.D.
Professor of Obstetrics and Gynecology
University of Vermont
Maine Medical Center
Portland, Maine

Anne M. Weber, M.D., M.S.
Program Officer
Contraception and Reproductive Health Branch
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National Institutes of Health
Bethesda, Maryland

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National Institute of Child Health and Human Development
National Institutes of Health
Bethesda, Maryland

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National Institute of Child Health and Human Development
National Institutes of Health
Bethesda, Maryland

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Center for Practice and Technology Assessment
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Director
Evidence-based Practice Centers Program
Center for Outcomes and Evidence
Agency for Healthcare Research and Quality
Rockville, Maryland

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Office of Research on Women's Health
National Institutes of Health
Bethesda, Maryland

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Chief
Digestive Diseases Program
Division of Digestive Diseases and Nutrition
National Institute of Diabetes and Digestive and Kidney Diseases
National Institutes of Health
Bethesda, Maryland

Victoria L. Handa, M.D.
Associate Professor
Department of Obstetrics and Gynecology
Johns Hopkins University
Baltimore, Maryland

Gary D.V. Hankins, M.D.
Professor and Vice Chairman
Department of Obstetrics and Gynecology
University of Texas Medical Branch at Galveston
Galveston, Texas

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Bethesda, Maryland

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Communications Director
Office of Medical Applications of Research
Office of the Director
National Institutes of Health
Bethesda, Maryland

Susan Meikle, M.D., M.S.P.H.
Medical Officer
Center for Outcomes and Evidence
Agency for Healthcare Research and Quality
Rockville, Maryland

Howard Minkoff, M.D.
Chairman
Department of Obstetrics and Gynecology
Maimonides Medical Center
Brooklyn, New York

Lata S. Nerurkar, Ph.D.
Senior Advisor for Consensus Development Program
Office of Medical Applications of Research
Office of the Director
National Institutes of Health
Bethesda, Maryland

Nancy J. Norton
President
International Foundation for Functional Gastrointestinal Disorders
Milwaukee, Wisconsin

Ingrid Nygaard, M.D., M.S.
Professor
Department of Obstetrics and Gynecology
University of Utah College of Medicine
Salt Lake City, Utah

William Oh, M.D.
Professor of Pediatrics
Brown Medical School
Attending Neonatologist
Women and Infants Hospital
Providence, Rhode Island

Vivian W. Pinn, M.D.
Associate Director for Research on Women's Health
Director
Office of Research on Women's Health
National Institutes of Health
Bethesda, Maryland

Tonse N.K. Raju, M.D.
Medical Officer and Program Scientist
Pregnancy and Perinatology Branch
Center for Developmental Biology and Perinatal Medicine
National Institute of Child Health and Human Development
National Institutes of Health
Bethesda, Maryland

Uma M. Reddy, M.D., M.P.H.
Medical Officer
Pregnancy and Perinatology Branch
National Institute of Child Health and Human Development
National Institutes of Health
Rockville, Maryland

Holly E. Richter, Ph.D., M.D.
Medical Surgical Gynecology
University of Alabama at Birmingham
Birmingham, Alabama

Susan Rossi, Ph.D., M.P.H.
Deputy Director
Office of Medical Applications of Research
Office of the Director
National Institutes of Health
Bethesda, Maryland

Mona Jaffe Rowe, M.C.P.
Associate Director
Office of Science Policy, Analysis, and Communications
National Institute of Child Health and Human Development
National Institutes of Health
Bethesda, Maryland

Benjamin P. Sachs, M.D.
Professor and Chair
Obstetrics and Gynecology
Beth Israel Deaconess Medical Center
Harvard Medical School
Professor
Department of Obstetrics and Gynecology
Harvard School of Public Health
Boston, Massachusetts

James R. Scott, M.D.
Editor
Obstetrics and Gynecology
Department of Obstetrics and Gynecology
University of Utah
Salt Lake City, Utah

Laura Toso, M.D.
Postdoctoral Fellow
Unit on Perinatal and Developmental Neurobiology
National Institute of Child Health and Human Development
National Institutes of Health
Bethesda, Maryland

Anne M. Weber, M.D., M.S.
Program Officer
Contraception and Reproductive Health Branch
National Institute of Child Health and Human Development
National Institutes of Health
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